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15. Abstract <u>Purpose and Need</u> Due to the rising construction costs and a high demand for construction materials, the North Dakota Department of Transportation (NDDOT) has been looking for alternatives to current culvert materials. The NDDOT has not used HDPE pipe extensively in the past for this type of application. With continued improvements in material properties, high density polyethylene (HDPE) pipe may be a viable alternative for culvert applications. This experimental study will be used to evaluate the installation and monitor the performance of HDPE pipe for approach and centerline drainage. <u>Objective</u> The objective of this research is to determine if HDPE has the structural capacity and durability to perform as an alternative to corrugated steel pipe (CSP) and reinforced concrete pipe (RCP) for culvert applications. This research will also evaluate the proposed installation detail for HDPE pipe. <u>Scope</u> For the evaluation of HDPE, four centerline culverts and four approach culverts are specified as HDPE pipe for project AC-HPP-NH-5-012(031)054, to be constructed in 2007. The installation of the eight HDPE pipes will be monitored, and the performance of the pipe will be evaluated and documented. Deflection testing will be performed by the contractor on the installed HDPE pipe as required in the NDDOT Standard Specifications. <u>Summary</u> The four 18" HDPE approach pipes were not installed in accordance with standard drawing D-714-14. Ordinary dirt was used instead of aggregate. After construction, in the fall of 2007, three of the four 18" HDPE approach pipes passed the 5% (17.1") mandrel test. The 18" approach pipe at location 1 did not pass the 5% mandrel test after construction. This pipe was reinstalled using D-714-14 standard drawing. The other approach pipes were left in place. Mandrel testing, performed to determine if the HDPE pipes were deflecting, was performed several times. The HDPE pipes were tested for construction acceptance on 10/20/07 and for evaluation reasons on 7/23/08, 08/31/09, 09/29/10, and 10/05/11. This test was conducted to determine if the pipe was deflecting greater than 5% at any point within each pipeline. In 2011 if a 5% mandrel could not pass through the pipeline a 7.5% mandrel was used to get a better understanding of how much deflection was occurring in the pipelines. The results from the latest HDPE mandrel testing were: One of the 18" approach pipes had ≤ 5% deflection at location 1. Three 18" approach pipes had > 5% but ≤ 7.5% at locations 2, 7, and 8. At locations 3 and 5 both centerline 24" pipes had deflections ≤ 5%. The centerline 30" at location 6 had a deflection ≤ 5% and the centerline 30" at location 4 had a deflection > 5% but ≤ 7.5%. The pavement profile over the pipes throughout the project seemed to get progressively worse. In 2008 the reason most likely was embankment settlement. In June of 2009 the Dickinson District maintenance employees placed cold mix asphalt to fill the dips above the pipes. The locations that have dips are not isolated to HDPE pipe locations. The 2011 profile data shows continued deterioration in most areas. The evaluation of the centerline HDPE pipes has not shown a change in pipe deflections since 2009.			
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